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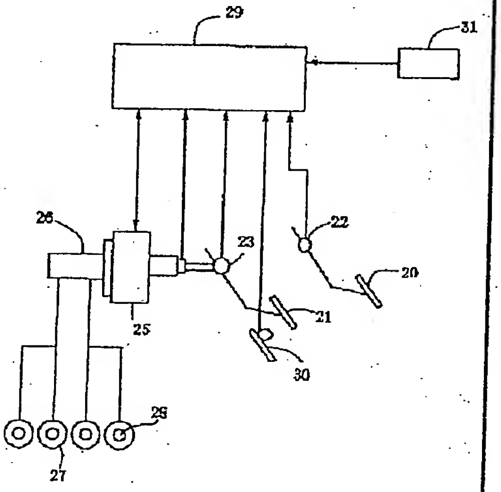
(54)BRAKE ASSIST SYSTEM

(57)Abstract:

PROBLEM TO BE SOLVED: To prevent a vehicle from colliding with another object moving at low speed even if the object movement is found hard to predict, while ensuring the vehicle's smooth travel.

SOLUTION: This system is provided with an accelerator-pedal stroke sensor 22, a brake-pedal stroke sensor 23, wheel speed sensors 28, a footrest pressure sensor 30 and a monitoring laser radar 31. A controller 29 detects an object stopped or moving at low speed, and becomes ready to effect brake assist control or effects the brakes automatically if finding this object lying or running in a warning area where it is liable to collide with the vehicle.



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DETAILED DESCRIPTION

[Detailed Description of the Invention]
[0001]
[The technical field to which invention belongs] This invention relates to a brake assistant system.
[0002]
[Description of the Prior Art] As a conventional brake assistant system, there is a thing as shown below, for example. In JP,4-25182,B, a laser radar etc. detects distance with the front, and when the distance is less than the safety distance set up beforehand, the attempt which both carries out auxiliary braking of the brake pressure to if the alarm of the risk is carried out to an operator at the time of treading in with a brake is proposed.
[0003]
[Problem(s) to be Solved by the Invention] However, when it may have come by the above-mentioned conventional technology on run extension wire immediately after although there was nothing on the run extension wire of a present self-vehicle while running a shopping center with much traffic, for example although detection could be ensured when an obstruction was on self-rolling-stock-run extension wire, since it was undetectable, there was a safe upper problem. Moreover, when such all situations were detected and auxiliary braking was performed, when not so urgent, control worked and there was a problem of causing trouble to a smooth run. This invention was made paying attention to such a conventional trouble, and supervises the front of a self-vehicle with a certain angle with a laser radar, a camera, etc. When the body under movement (a pedestrian and a bicycle are assumed) is detected at a halt object or a low speed in the surveillance range, It has a means to judge that it is running the watch field which may collide when the detection carries out predetermined-time continuation exceeding predetermined frequency. in that case Carry out or that the control threshold of the brake assistant system which detects an operator's urgent brakes operation and performs auxiliary braking is changed, and it is easy to start control (Claims 2 and 3), Make it stand by or so that a brake force can react immediately to brakes operation (A claim 4), Emergency is judged from the treading strength change concerning accelerator operation of an operator, the foot transfer time to a brake, and a foot rest, and the initiative is taken in an operator's brakes operation. perform an automatic braking system or (Claims 5, 6, and 7), Prediction of movement, such as a pedestrian and a bicycle, can prevent a collision also to a difficult situation, reducing the vehicle speed or maintaining a smooth run by what an alarm is given for to (a claim 8) and an operator (claim 9).
[0004]
[Means for Solving the Problem] That is, invention according to claim 1 was taken as the composition judged to be under a watch field run, when predetermined-time continuation of this detection was carried out, a means to supervise the front of self-vehicles by predetermined angle within the limits, a means by which this surveillance means detects the body under movement at a halt object or a low speed, and. Invention according to claim 2 is set to a brake assistant system according to claim 1. A means to detect an operator's brakes operation, and a means to judge that it is urgent when the amount of brakes operation exceeds a predetermined threshold, When it had an auxiliary braking means to generate a brake force higher than the brake force operated by the operator, in case of emergency and was judged as under a watch field run, the threshold of the aforementioned amount of brakes operation was made small, and it considered as the composition

make it easy to go into urgent judgment. Invention according to claim 3 was taken as the operating speed of a brake with an operator's brakes operation in the brake assistant system according to claim 2. Invention according to claim 4 was taken as composition with a means to generate the very small brake force near 0, while the operator was not operating the brake, when judged as under a watch field run in a brake assistant system according to claim 1. Invention according to claim 5 was taken as the composition which performs automatic braking, when it had a means to detect an operator's accelerator pedal control input, a means to compute accelerator operating speed from the detected accelerator control input, and an automatic-braking means to generate brake forces arbitrary irrespective of an operator's brakes operation, in a brake assistant system according to claim 1, it was judged as under a watch field run and accelerator operating speed was beyond a predetermined value. In the brake assistant system according to claim 1, invention according to claim 6 was taken as the composition which performs automatic braking, when it had the brake assistant system which consists of a means to detect the foot transfer time from accelerator pedal operation of an operator to brake pedal application, and an automatic-braking means to generate brake forces arbitrary irrespective of an operator's brakes operation, it was judged as under a watch field run and the foot transfer time from accelerator pedal operation to brake pedal application was less than a predetermined time. Invention according to claim 7 was taken as the composition which performs automatic braking, when it had a means to detect the treading strength concerning an operator's foot rest in a brake assistant system according to claim 1, a means to compute the increase speed of this treading strength, and an automatic-braking means to generate brake forces arbitrary irrespective of an operator's brakes operation, it was judged as under a watch field run and the increase speed in foot-rest treading strength was beyond a predetermined value. In the brake assistant system according to claim 1, invention according to claim 8 was taken as the composition which performs automatic braking, when it had a means to detect the speed of vehicles, and an automatic-braking means to generate brake forces arbitrary irrespective of an operator's brakes operation, it was judged as under a watch field run and the speed of vehicles was beyond a predetermined value. In the brake assistant system according to claim 1, invention according to claim 9 was taken as the composition which gives an alarm to an operator, when judged as under a watch field run.

[0005]

[Embodiments of the Invention] Hereafter, the gestalt of implementation of this invention is explained based on a drawing. Drawing 1 and drawing 2 are drawings showing the gestalt of implementation of this invention. Drawing 1 is the whole block diagram and drawing 2 is the block diagram of a negative pressure booster. When composition is explained first, the accelerator stroke sensor by which in 20 of drawing 1 an accelerator pedal and 21 detect a brake pedal and 22 detects the control input of an accelerator pedal, and 23 are brake stroke sensors which detect the control input of a brake pedal.

[0006] 25 is a negative pressure booster which the solenoid valve builds in, and shows the detail to below-mentioned drawing 2 . 26 is a master cylinder, 27 is each wheel, and the wheel speed sensor 28 detects the rotational speed. 30 is a foot-rest treading strength sensor which detects the treading strength concerning a foot rest. 31 is the laser radar attached in the vehicles front front grill, and the distance between two cars with front vehicles is detected.

[0007] In 29, it is the control unit which performs brake assistance, and the control routine mentions later. The information before and behind [G] an accelerator stroke, a brake stroke, wheel rotational speed, the distance between two cars, and vehicles is inputted into a control unit 29, and the control signal which drives the below-mentioned solenoid valve 5 is outputted to it.

[0008] Drawing 2 explains the structure of the negative pressure booster 25. 1 is a transformation room and the pressure with the below-mentioned negative pressure room 2 balances in the negative pressure state at the time of brake un-braking. At the time of brake braking, the atmosphere is introduced, differential pressure with the negative pressure room 2 arises, and the load which doubled the power to the master cylinder 26 is transmitted. 2 is a negative pressure room and predetermined negative pressure has always generated it during engine starting. 3 is a vacuum valve, when a brake pedal 21 strokes by the driver, or when the below-mentioned solenoid valve 5 excites, it is closed, and it intercepts a free passage with the negative pressure room 2 and the transformation room 1. 4 is a breather valve, when a brake pedal 21 strokes by the driver, or when the below-mentioned solenoid valve 5 excites, it opens, and the atmosphere is introduced into the transformation room 1. the time of an operation rating rod and 7 being push rods, and a solenoid valve 5 being excited [as for 5 / 7] for a solenoid-valve linkage member and 8, as for a solenoid valve and 6 -- solenoid-valve linkage -- a member 7 strokes leftward in drawing and switching operation of the vacuum valve 3 and a breather valve 4 is performed Differential pressure arises between the negative pressure room 2 and the transformation room 1 by that cause, the force gets across to a push rod 8 and a master cylinder 26 through a reaction disc 9, and a brake occurs to each wheel 27.

[0009] Next, an operation is explained. Drawing 3 , drawing 4 , and drawing 5 are flow charts which show data processing of a control unit 29. This routine is an interrupt handler performed a predetermined period (period which flows once to 10msec(s) with the gestalt of this operation).

[0010] At Step S100, the self-vehicle speed v is first read from the rotational speed of a wheel. Next, at Step S101, the safety distance x1 to a front obstruction is computed based on the self-vehicle speed v. With the gestalt of this operation, it is asking physically by v from the sum of a possible stopping distance (=v**2/2g, g=0.6G) and a free running distance (=T*v, T=1.0sec) after recognizing risk until it performs brakes operation.

[0011] At Step S102, the distance x of an actual self-vehicle and a front obstruction is read from a laser radar 31.

[0012] Next, at Step S103, whether x detected is larger than the safety-distance desired value x1 and when it approaches too much, and it is judged whether it is ****** and passing approaches, it progresses to Step S104, and an increment is carried out, and the counter value cnt of contiguity information progresses to Step S105, when that is not right.

[0013] At Step S105, it is judged for the contiguity information counter value within a predetermined time (for example, 5 seconds) whether it is more than the number of times Cs of predetermined. It is judged that it is running a watch field with many traffic and vehicles in more than Cs. It sets up so that the below-mentioned threshold for brake assistance may be made small at Step S106 and it may be easy to go into brake assistance. An alarm tone is sounded with Step S107 to an operator, and at Step S108, CA flag which shows that it is [watch field] under run is set to 1, and it progresses after Step 200.

[0014] On the other hand, by judgment of Step S105, it judges that it is not [watch field / be / it] under run in cnt<Cs, the below-mentioned threshold for brake ASHITO systems is returned to normal (it is a little large so that an incorrect judgment included in control may not be made) at Step S109, and an alarm tone is terminated at Step S110, and at Step S111, CA flag which shows that it is / alarm field / under run is cleared to 0, and it progresses after Step S200

[0015] At Step S200, when it is judged whether it gets into the accelerator pedal 20 and it gets into it, the ACC flag which shows the state of an accelerator pedal at Step S210 is cleared to 0, and a routine is ended, and when that is not right, it progresses to Step S201.

[0016] At Step S201, the ACC flag which shows the state of an accelerator pedal 20 is set to 1, and the amount of strokes of a brake pedal 21 is detected by Step S202. At Step S203, brake stroke speed is computed from the history of the past of the detected amount of brake sault rokes.

[0017] In Step S204, when it is judged whether it gets into the brake pedal 21 and it does not get into it (namely, state of getting also neither into an accelerator nor a brake), it progresses to Step S300, and when breaking in, the judgment of bus-available flag is performed at Step S205. bus-available flag is a flag reset by 0, when it is set to 1 when it is presumed that an operator's stroke speed is large and a state of emergency, and a brake pedal 21 is able to be returned (Step S300).

[0018] When bus-available flag is set at Step S205, it progresses to Step S207 and assistant control is continued, and when that is not right, it is judged at Step S206 whether they are whether brake stroke speed is larger than bus-available threshold and a state of emergency. By the judgment of Step S206, when brake stroke speed is larger than bus-available threshold, it progresses to Step S207 and assistant control is performed, and when that is not right, assistant control is canceled at Step S208 (or it does not carry out).

[0019] As a concrete example which performs assistant control at Step S207, a solenoid valve 5 is driven so that the vacuum valve 3 of the negative pressure booster 25 may serve as a closed position and a breather valve 4 may serve as an open position, by introducing the atmosphere into the transformation room 1, differential pressure with the negative pressure room 2 is generated, and a fluid pressure is generated in a master cylinder 26 - a wheel cylinder.

[0020] As a concrete example of which assistant control is canceled at Step S208 on the other hand, a solenoid valve 5 is driven and control is ended so that the vacuum valve 3 of the negative pressure booster 25 may serve as an open position and a breather valve 4 may serve as a closed position. In addition, since the vacuum valve 3 serves as an open position and a breather valve 4 serves as a closed position by the energization force of a spring, intercepting energization of a solenoid valve 5 is also given to the purpose of a control end.

[0021] Next, it is in explanation when a brake pedal is judged to be OFF at Step S204. In this case, it progresses to Step S300, and as already explained, bus-available flag is reset by 0.

[0022] Next, if CA flag which shows whether it is running the watch field at Step S301 was seen, the flag has left and it becomes during a run about a watch field, it will progress to Step S302, and if that is not right, it will progress to Step S306 and the below-mentioned automatic braking system will not carry out.

[0023] At Step S302, when the ACC flag which shows the state of an accelerator pedal 20 is seen and the ACC flag is set (i.e., when an accelerator pedal 20 is OFF, and it progresses after Step S303 and gets into the accelerator pedal 20), it progresses to Step S306 and the below-mentioned automatic braking system does not carry out.

[0024] In Step S303, it is judged whether it is beyond a predetermined value, in beyond a predetermined value, the return speed of an accelerator pedal 20 progresses to Step S307, and when that is not right, it is judged for the foot transfer time from an accelerator pedal 20 to a brake pedal 21 at Step S304 whether it is less than a predetermined time.

[0025] In more than a predetermined time, it progresses to Step S307, when that is not right, it is judged for the augend per unit time of foot-rest treading strength at Step S305 whether it is beyond a predetermined value, when it is beyond a predetermined value, it progresses to Step S307, and when that is not right, it progresses to Step S306 and the below-mentioned automatic braking system does not carry out.

[0026] Namely, by the routine of step S303-305, an operator perceives risk, return an accelerator quickly, or step on quickly, and it changes, or judges whether the force went into the foot rest, and, in such a case, the automatic braking system is operated.

[0027] As a concrete example which performs automatic-braking-system control at Step S307, a solenoid valve 5 is driven so that the vacuum valve 3 of the negative pressure booster 25 may serve as a closed position and a breather valve 4 may serve as an open position, by introducing the atmosphere into the transformation room 1, differential pressure with the negative pressure room 2 is generated, and a fluid pressure is generated in a master cylinder 26 - a wheel cylinder.

[0028] As a concrete example of which automatic-braking-system control is canceled at Step S306 on the other hand, a solenoid valve 5 is driven and control is ended so that the vacuum valve 3 of the negative pressure booster 25 may serve as an open position and a breather valve 4 may serve as a closed position. In addition, since the vacuum valve 3 serves as an open position and a breather valve 4 serves as a closed position by the energization force of a spring, intercepting energization of a solenoid valve 5 is also given to the purpose of a control end.

[0029]

[Effect of the Invention] Even if a difficult situation has prediction of the movement of the body under movement at a low speed, maintaining a smooth run if it is in the brake assistant system of this invention as explained above, the effect that the collision with this body can be prevented is acquired.

[Translation done.]

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CLAIMS

[Claim(s)]

[Claim 1] A means to supervise the front of self-vehicles by predetermined angle within the limits, a means by which this surveillance means detects the body under movement at a halt object or a low speed, and the brake assistant system judged to be under a watch field run when predetermined-time continuation of this detection is carried out.

[Claim 2] A means to detect an operator's brakes operation in a brake assistant system according to claim 1, A means to judge that it is urgent when the amount of brakes operation exceeds a predetermined threshold, An auxiliary braking means to generate a brake force higher than the brake force operated by the operator in case of emergency, The brake assistant system which made small the threshold of the aforementioned amount of brakes operation, and was characterized by making it easy to go into urgent judgment when judged as under ****** and a watch field run.

[Claim 3] It is the brake assistant system characterized by an operator's brakes operation being the operating speed of a brake in the brake assistant system according to claim 2.

[Claim 4] The brake assistant system characterized by having a means to generate the very small brake force near 0 while the operator is not operating the brake, when judged as under a watch field run in a brake assistant system according to claim 1.

[Claim 5] The brake assistant system characterized by performing automatic braking when it had a means to detect an operator's accelerator pedal control input, a means to compute accelerator operating speed from the detected accelerator control input, and an automatic-braking means to generate brake forces arbitrary irrespective of an operator's brakes operation, in a brake assistant system according to claim 1, it was judged as under a watch field run and accelerator operating speed was beyond a predetermined value.

[Claim 6] The brake assistant system characterized by performing automatic braking when it had a means to detect the foot transfer time from accelerator pedal operation of an operator to brake pedal application, and an automatic-braking means to generate brake forces arbitrary irrespective of an operator's brakes operation, in a brake assistant system according to claim 1, it was judged as under a watch field run and the foot transfer time from accelerator pedal operation to brake pedal application was less than a predetermined time.

[Claim 7] The brake assistant system characterized by performing automatic braking when it had a means to detect the treading strength concerning an operator's foot rest in a brake assistant system according to claim 1, a means to compute the increase speed of this treading strength, and an automatic-braking means to generate brake forces arbitrary irrespective of an operator's brakes operation, it was judged as under a watch field run and the increase speed in foot-rest treading strength was beyond a predetermined value.

[Claim 8] The brake assistant system characterized by performing automatic braking when it had a means to detect the speed of vehicles, and an automatic-braking means to generate brake forces arbitrary irrespective of an operator's brakes operation, in a brake assistant system according to claim 1, it was judged as under a watch field run and the speed of vehicles was beyond a predetermined value.

[Claim 9] The brake assistant system characterized by giving an alarm to an operator in the brake assistant system according to claim 1 when judged as under a watch field run.

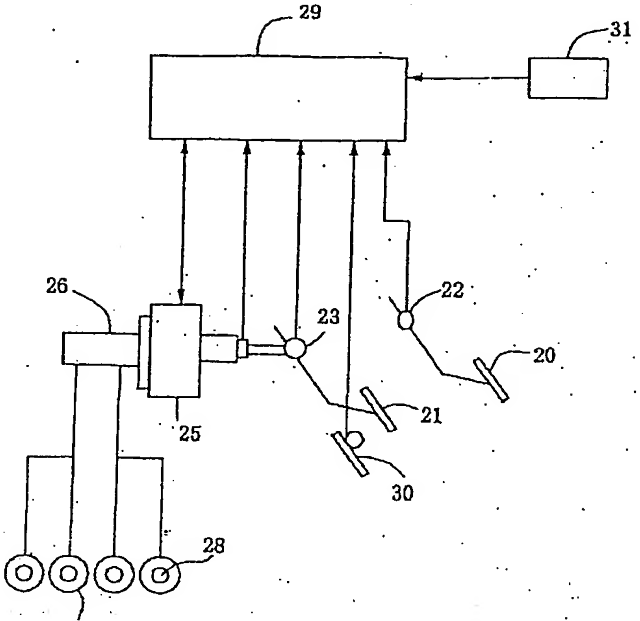
29
31
26
23
22
20
21
30
25
28
27

FIG. 1

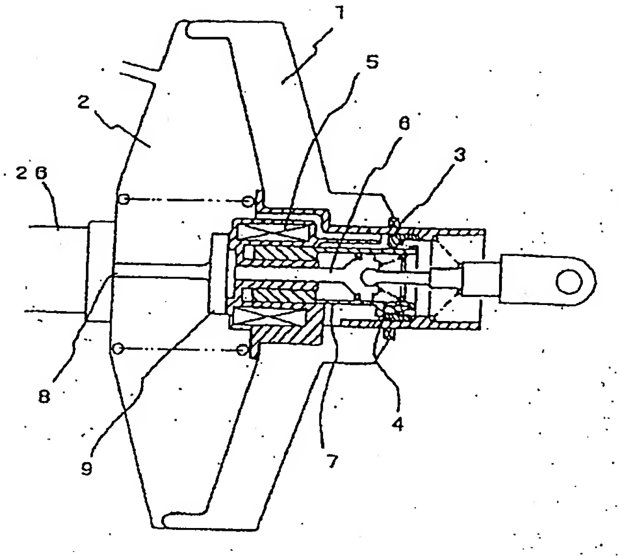
1
5
2
6
3
26
8
9
7
4

FIG. 2

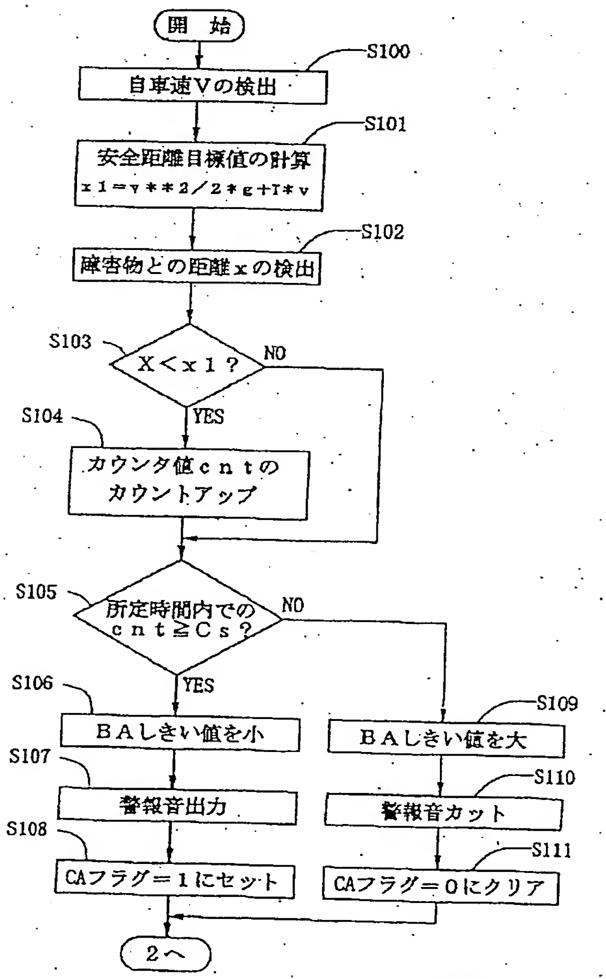
開　始
S100
自車速Vの検出
S101
安全距離目標値の計算
x1＝v＊＊2／2＊g＋T＊v
S102
障害物との距離xの検出
S103
X＜x1？
NO
YES
S104
カウンタ値cntの
カウントアップ
S105
所定時間内での
cnt≧Cs？
NO
YES
S106
BAしきい値を小
S107
警報音出力
S108
CAフラグ＝1にセット
S109
BAしきい値を大
S110
警報音カット
S111
CAフラグ＝0にクリア
2へ

FIG. 3

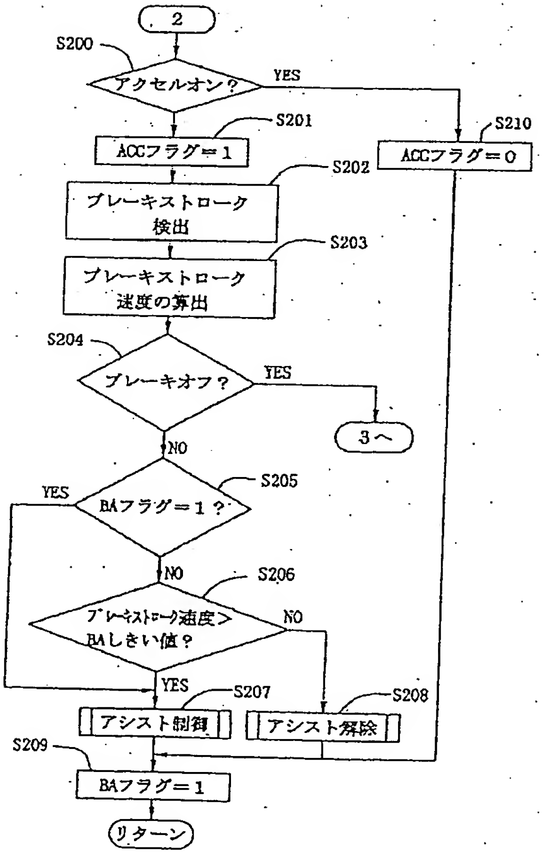
2
S200
アクセルオン？
YES
S201
ACCフラグ＝1
S210
ACCフラグ＝0
S202
ブレーキストローク
検出
S203
ブレーキストローク
速度の算出
S204
ブレーキオフ？
YES
3へ
NO
S205
BAフラグ＝1？
YES
NO
S206
ブレーキストローク速度＞
BAしきい値？
NO
YES
S207
アシスト制御
S208
アシスト解除
S209
BAフラグ＝1
リターン

FIG. 4

PN: 11255087

DT: JPA1 PATENT APPLICATION

TIEN: BRAKE ASSIST SYSTEM.

IC: B60T007-12

IS: B60T011-16

PA: NISSAN MOTOR CO LTD.

IN: TAMURA MINORU. MAEDA KOZO. INOUE HIDEAKI.

AI: 19980310 JP 10-58311

OI: 19990921

AB: PROBLEM TO BE SOLVED: To prevent a vehicle from colliding with another object moving at low speed even if the object movement is found hard to predict, while ensuring the vehicle's smooth travel. SOLUTION: This system is provided with an accelerator-pedal stroke sensor 22, a brake-pedal stroke sensor 23, wheel speed sensors 28, a footrest pressure sensor 30 and a monitoring laser radar 31. A controller 29 detects an object stopped or moving at low speed, and becomes ready to effect brake assist control or effects the brakes automatically if finding this object lying or running in a warning area where it is liable to collide with the vehicle.

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